



**PATENT**  
Attorney Docket No. 402722

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

LUI et al.

Art Unit: 1745

Application No. 10/621,333

Examiner: John S. Maples

Filed: July 18, 2003

For: RECHARGEABLE BATTERY PACK

**CLAIM OF PRIORITY**

Commissioner for Patents  
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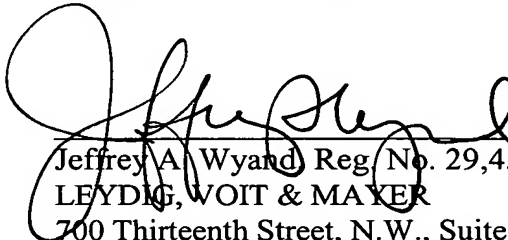
Dear Sir:

In accordance with the provisions of 35 USC 119, Applicants claim the priority of the following application or the applications (if more than one application is set out below):

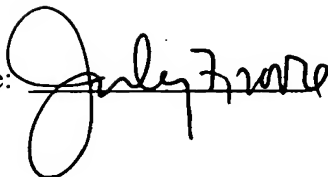
Application No. 0218736.7, filed in Great Britain on August 12, 2002.

A certified copy of the above-listed priority documents is enclosed.

Respectfully submitted,

  
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INVESTOR IN PEOPLE

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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Dated 15 July 2003

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# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference **GBP86450**

2. Patent application number  
(The Patent Office will fill in this part)

**0218736.7**

**12 AUG 2002**

3 Full name, address and postcode of the or of each applicant (underline all surnames)

Choon Nang Electrical Appliance Mfy., Ltd.,  
11th Floor  
Ha Lung Industrial Building  
52 Wong Chuk Hang Road  
Aberdeen  
Hong Kong

Patents ADP number (if you know it)

**833 7453001**

If the applicant is a corporate body, give the country/state of its incorporation

Hong Kong

4. Title of the invention **Rechargeable Battery Pack**

5. Name of your agent (if you have one)  
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Marks & Clerk  
57 - 60 Lincolns Inn fields  
London WC2A 3LS

Patents ADP number (if you know it)

**18001**

6.If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application No  
(if you know it)

Date of filing  
(day / month / year)

7.If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

**Yes**

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

**Patents Form 1/77**

Enter the number of sheets for any of the following items you are filing with this form.  
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Continuation sheets of this form	0
Description	10
Claim(s)	4
Abstract	1
Drawing(s)	7 + 7

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10. If you are also filing any of the following,  
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Priority documents

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Statement of inventorship and right  
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Request for preliminary examination  
and search (Patents Form 9/77)

Request for substantive examination  
(Patents Form 10/77)

Any other documents  
(please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature  Date: 12 August 2002

12. Name and daytime telephone number of  
person to contact in the United Kingdom

GB Patent Filings  
0207 400 3000

DUPLICATE

RECHARGEABLE BATTERY PACK

The present invention relates to a rechargeable battery pack that is detachable from a power tool such as a  
5 drill, for connection to a recharging stand.

BACKGROUND OF THE INVENTION

The invention relates more particularly to a rechargeable  
10 battery pack having a supplementary electrical contact to engage with a contact on the recharging stand, and with which a mechanical locking device, by which the battery pack can be engaged securely with the power tool, is associated.

15

Rechargeable power tools are known. For example, rechargeable drills can have rechargeable batteries incorporated permanently therein, or can have removable battery packs. Power tools having removable battery packs  
20 are more versatile because several battery packs can be pre-charged for stand-by interchangeability during use of the power tool. That is, the tool needs not remain idle when its batteries are being recharged.

25 Power tools such as drills having replaceable battery packs, have various means of inter-engagement between the tool (usually at the base of the handle) and the battery pack. Such means serve not only to secure the components

together mechanically, but also to provide proper electrical contact. When the battery pack is removed, it can be recharged. This can be achieved by attaching a wire from a mains-powered step-down transformer to the battery pack, or by mounting the battery pack itself on a recharging stand within which a step-down transformer is housed.

Many recharging stands have been proposed for this purpose. Some battery pack/recharging stand combinations have separate means of electrical and mechanical inter-engagement. Others have combined electrical/mechanical inter-engagement structures, but these can be more complicate in design and usability than might be desirable. For example, although a desirable feature is to securely lock the battery pack in place upon the power tool, it is not necessarily convenient to lock the battery pack securely in place upon the recharging stand.

## 20 OBJECTS OF THE INVENTION

It is an object of the present invention to overcome or substantially ameliorate at least one of the above disadvantages and/or more generally to provide an improved battery pack for a power tool.

It is a further object of the present invention to provide an improved combination of a battery pack, power tool and



recharging stand, having improved electrical and mechanical inter-engagement between the battery pack and the power tool on the one hand, and improved electrical contact between the battery pack and the recharging stand  
5 on the other.

#### SUMMARY OF THE INVENTION

According to the invention, there is provided a battery  
10 pack for a power tool, comprising:

a casing within which a rechargeable cell or cells is or are housed,

a receiving bay formed in the casing and into which slide-in parts of the power tool, or of a recharging stand  
15 can be received to thereby retain the battery pack,

a pair of primary electrical contacts in or adjacent to the receiving bay and electrically associated with the rechargeable cell or cells,

a recess that opens into the receiving bay,  
20 a supplementary electrical contact located within the recess, and

a user-manipulable catch located within the recess alongside the supplementary electrical contact.

25 Preferably, the catch co-operates with the power tool, but not with the recharging stand.

Preferably, the supplementary electrical contact co-

operates with the recharging stand, but not with the power tool.

Put another way, preferably, the catch does not engage  
5 with the recharging stand, but the supplementary electrical contact does.

Similarly, put another way, preferably, when the battery pack is attached to the power tool, the catch secures the  
10 battery pack to the power tool mechanically, but the supplementary electrical contact does not make electrical contact with the power tool.

To complement the above, preferably, the recess provides a  
15 supplementary electrical contact between the battery pack and the power stand without the catch engaging therewith.

Preferably, the receiving bay includes rails to be received within tracks of the power tool or recharging  
20 stand.

Preferably, the user-manipulable catch includes a trigger accessible from the casing exterior.

25 Preferably, the catch includes at least one catch member for mechanical interaction with a co-operable part of a power tool.

Preferably, the primary electrical contacts and the supplementary electrical contact are elongate and parallel with one another.

- 5 More preferably, the supplementary electrical contact is located centrally between the primary electrical contacts.

It is preferred that the recess is located centrally between the primary electrical contacts.

10

It is preferred that the catch includes a pair of the catch members, and the supplementary electrical contact is located centrally between the two catch members.

- 15 Preferably, the battery pack includes a temperature sensor electrically associated with the supplementary electrical contact.

- 20 The invention also provides a combination of the battery pack, a power tool and a recharging stand. The power tool includes slide-in parts receivable into the receiving bay and a pair of electrical contacts for connection with the primary electrical contacts of the battery pack respectively. The recharging stand includes slide-in parts
- 25 receivable into the receiving bay and a pair of primary and a supplementary electrical contacts for connection with the primary and supplementary electrical contacts of the battery pack respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will now  
5 be described, by way of example only, with reference to  
the accompanying drawings, in which:

Figure 1 is a perspective view of a power tool using an  
embodiment of a battery pack in accordance with the  
10 invention, partially engaged therewith;

Figure 2 is a partially cut-away perspective view of the  
battery pack of Figure 1, engaged upon a recharging  
stand;

15 Figure 3 is an exploded perspective view of the battery  
pack of Figure 1;

Figure 4 is a partially cut-away perspective view of the  
20 battery pack fully engaged with the power tool of Figure  
1;

Figure 5 is a partially cut-away perspective view of the  
battery pack partially engaged with the power tool of  
25 Figure 1;

Figure 6 is a close-up plan view showing inter-engaging components of the battery pack and the recharging stand of Figure 2;

- 5 Figure 7 is a schematic circuit diagram of the battery pack of Figure 3; and

Figure 8 is a schematic circuit diagram of the recharging stand of Figure 2.

10

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the accompanying drawings, there is shown a power drill T to which there is partially attached a  
15 battery pack 10 embodying the invention. The battery pack 10 includes a lower casing part 11 and an upper casing part 12 that are screwed or otherwise held together to form a casing within which a number of battery cells 24 (Figure 3) are housed.

20

The upper casing 12 includes a receiving bay 18 having laterally opposed rails 30 that extend into corresponding laterally opposed tracks 13 formed in the bottom of the power drill T. The rails 30 and tracks 13 form a secure  
25 mechanical engagement between the battery pack 10 and the power tool T upon sliding inter-engagement in the direction indicated by arrow A.

The power drill T includes, in its handle base, a tongue 14 that slides into a recess 15 of the receiving bay 18 upon full sliding engagement of the drill T and battery pack 10. The recess 15 opens into the receiving bay 18. A  
5 release trigger 19 is provided in the upper casing part 12. Formed integrally with the release trigger 19 is a retaining catch 23 having a pair of upstanding pawls 26. The retaining catch 23 resides within the recess 15 and engages with co-operable pawls 27 formed on the tongue 14  
10 when the battery pack 10 is fully engaged with the power drill T. To this end, the pawls 26 and 27 are provided with mutually inter-engaging ramp surfaces as shown. Only upon depression of trigger 19 is it possible to detach the battery pack 10 from the power drill T. That is,  
15 depression of the trigger 19 causes downward movement of pawls 26, which thereby disengage from the corresponding pawls 27 of the power drill T.

A pair of primary electrical contacts 16, in the form of  
20 blades, is provided within or adjacent the receiving bay 18 of the battery pack 10 and located symmetrically on opposite sides of the recess 15. The primary electrical contacts 16 are in circuit with the rechargeable battery cells 24. Each primary contact 16 extends longitudinally  
25 in a direction parallel to the rails 30 such that upon sliding engagement of the battery pack 10 with the power drill T, they engage with spring clip-like electrical contacts located within terminals 31 of the power tool T.

Situated beneath the retaining catch 23 and within the recess 15, there is a supplementary electrical contact 17 in the form of another blade. The supplementary electrical contact 17 extends in a direction parallel to the primary electrical contacts 16, and is located centrally between the primary contacts 16 and also centrally between the two pawls 26 of the catch 23. Upon engagement of the battery pack 10 with the power tool T, the supplementary electrical contact 17 passes into the space S between the pawls 26 without making any electrical contact with the power tool T.

Extending from the supplementary electrical contact 17 is a conductor 25 leading to a temperature probe located alongside or amongst the rechargeable battery cells 24 to thereby sense the battery temperature.

A recharging stand 20 houses a step-down transformer receiving the mains power via an electrical cord 21. The recharging stand 20 includes a battery cradle 22. The cradle 22 is formed much like the components at the base of the power drill T, including a pair of opposed tracks 32 along which the rails 30 of the battery pack 10 ride. The recharging stand 20 includes a pair of spring clip-like primary terminals 28 into which the blade-like primary contacts 16 of the battery pack 10 are received for the purpose of conveying electrical current from the

transformer located within the stand 20 to the rechargeable cells 24. Also provided is a supplementary spring clip-like terminal 29 with which the supplementary contact 17 engages.

5

The terminal 29 relays temperature signals from the temperature probe to the circuitry of the battery stand 20 shown in Figure 8. The circuitry includes a battery insertion detector and an over-temperature detector, an  
10 LED control circuit and related circuitry which upon detection of excessive battery temperature terminates recharging current to the terminals 28.

When the battery pack 10 is engaged upon the recharging  
15 stand 20, the retaining catch 23 and trigger 19 perform no function.

It should be appreciated that modifications and alterations obvious to those skilled in the art are not  
20 to be considered as beyond the scope of the present invention. For example, instead of a drill, the power tool T might be a hand-held sander, angle grinder or any other hand-held power tool.



CLAIMS:

1. A battery pack for a power tool, comprising:
  - a casing within which a rechargeable cell or cells is
  - 5 or are housed,
  - a receiving bay formed in the casing and into which
  - slide-in parts of the power tool, or of a recharging stand
  - can be received to thereby retain the battery pack,
  - a pair of primary electrical contacts in or adjacent
  - 10 to the receiving bay and electrically associated with the
  - rechargeable cell or cells,
  - a recess that opens into the receiving bay,
  - a supplementary electrical contact located within the
  - recess, and
  - 15 a user-manipulable catch located within the recess
  - alongside the supplementary electrical contact.
  
2. A combination of the battery pack as claimed in Claim 1, a power tool and a recharging stand, wherein the power
- 20 tool includes slide-in parts receivable into the receiving
- bay and a pair of electrical contacts for connection with
- the primary electrical contacts of the battery pack
- respectively, and wherein the recharging stand includes
- slide-in parts receivable into the receiving bay and a
- 25 pair of primary and a supplementary electrical contacts
- for connection with the primary and supplementary
- electrical contacts of the battery pack respectively.

3. The combination as claimed in Claim 2, wherein the catch is configured to co-operate with the power tool, but not with the recharging stand.

5 4. The combination as claimed in Claim 2, wherein the supplementary electrical contact of the battery pack is configured to co-operate with the recharging stand, but not with the power tool.

10 5. The combination as claimed in Claim 2, wherein the catch does not engage with the recharging stand, but the supplementary electrical contact of the battery pack makes contact with the recharging stand.

15 6. The combination as claimed in Claim 2, wherein when the battery pack is attached to the power tool, its catch secures the battery pack to the power tool mechanically, but its supplementary electrical contact does not make electrical contact with the power tool.

20

7. The combination as claimed in any one of Claims 2 to 6, wherein the receiving bay includes rails to be received within tracks of the power tool or recharging stand.

25 8. The battery pack as claimed in Claim 1, wherein the user-manipulable catch includes a trigger accessible from the casing exterior.

9. The battery pack as claimed in Claim 1 or Claim 8, wherein the catch includes at least one catch member for mechanical interaction with a co-operable part of a power tool.

5

10. The battery pack as claimed in any one of Claims 1, 8 and 9, wherein the primary electrical contacts and the supplementary electrical contact are elongate and parallel with one another.

10

11. The battery pack as claimed in Claim 10, wherein the supplementary electrical contact is located centrally between the primary electrical contacts.

15

12. The battery pack as claimed in Claims 1 and 8 to 11, wherein the recess is located centrally between the primary electrical contacts.

20

13. The battery pack as claimed in Claim 9, wherein the catch includes a pair of the catch members, and the supplementary electrical contact is located centrally between the two catch members.

25

14. The battery pack of any one of Claims 1 and 8 to 13, further comprising a temperature sensor electrically associated with the supplementary electrical contact.

15. A battery pack for a power tool, substantially as

hereinbefore described with reference to Figures 1 to 8 of the accompanying drawings.

ABSTRACT

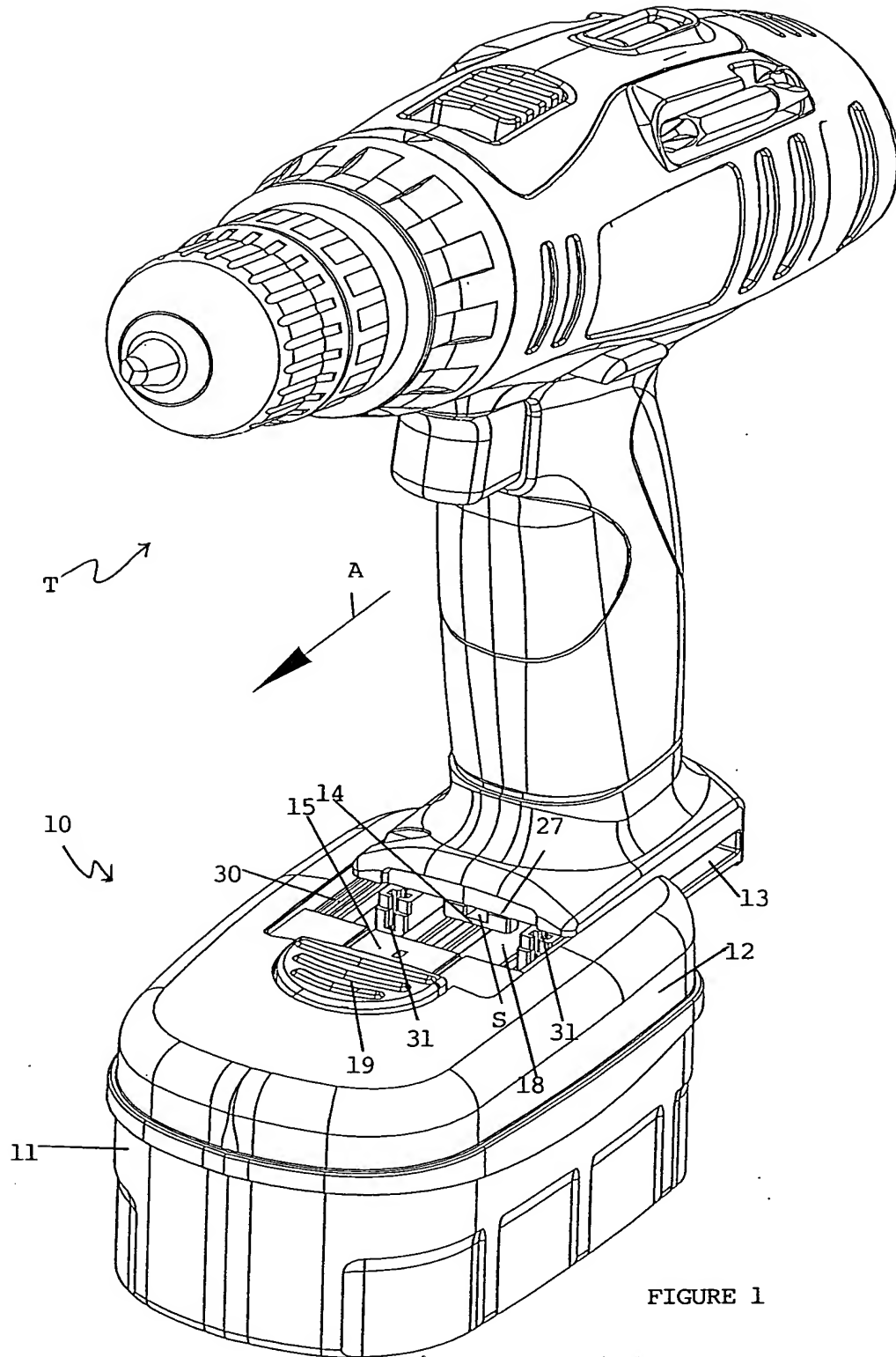
RECHARGEABLE BATTERY PACK

5 A battery pack (10) for a power tool (T) includes a casing (11/12) within which rechargeable cells (24) are housed. A receiving bay (18) is formed in the casing (11/12) and receives slide-in parts of the power tool (T), or of a recharging stand (20) to retain the battery pack (10). A  
10 pair of primary electrical contacts (16) is located in or adjacent to the receiving bay (18). A recess (15) opens into the receiving bay (18). A supplementary electrical contact (17) is located within the recess (15), and a user-manipulable catch (23) is also located within the  
15 recess (15) alongside the supplementary electrical contact (17). That is, a single recess (15) houses both a supplementary electrical contact (17) and mechanical catch (23). The supplementary electrical contact (17) is usable when recharging the battery (24) to relay battery  
20 temperature information to a recharging stand (20), but has no function when the battery pack (10) is attached to the power tool (T). The catch (23) - useful in retaining the battery pack (10) to the power tool (T), has no function in relation to the recharging stand (20).

25

[Figure 2]

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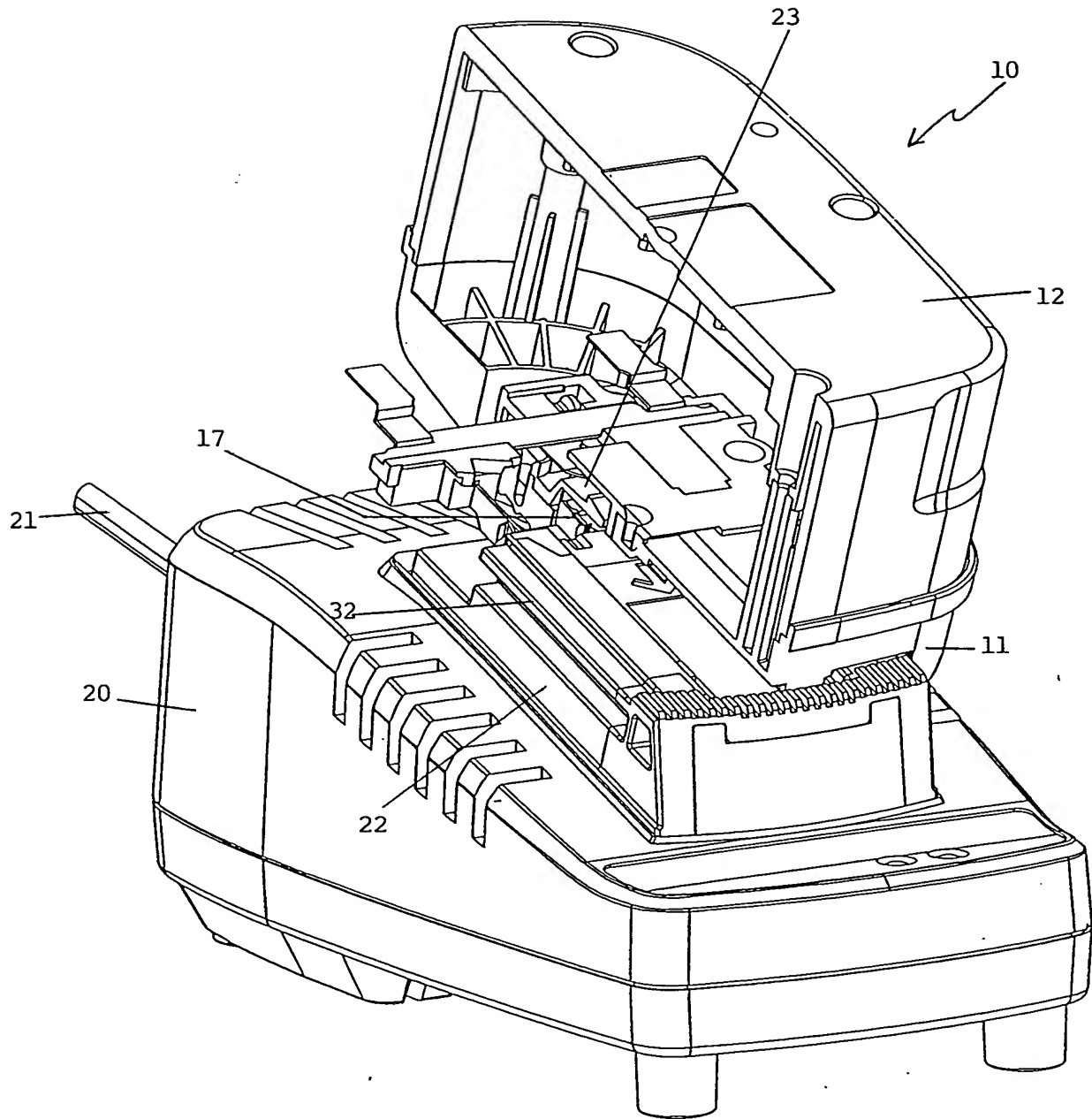


FIGURE 2

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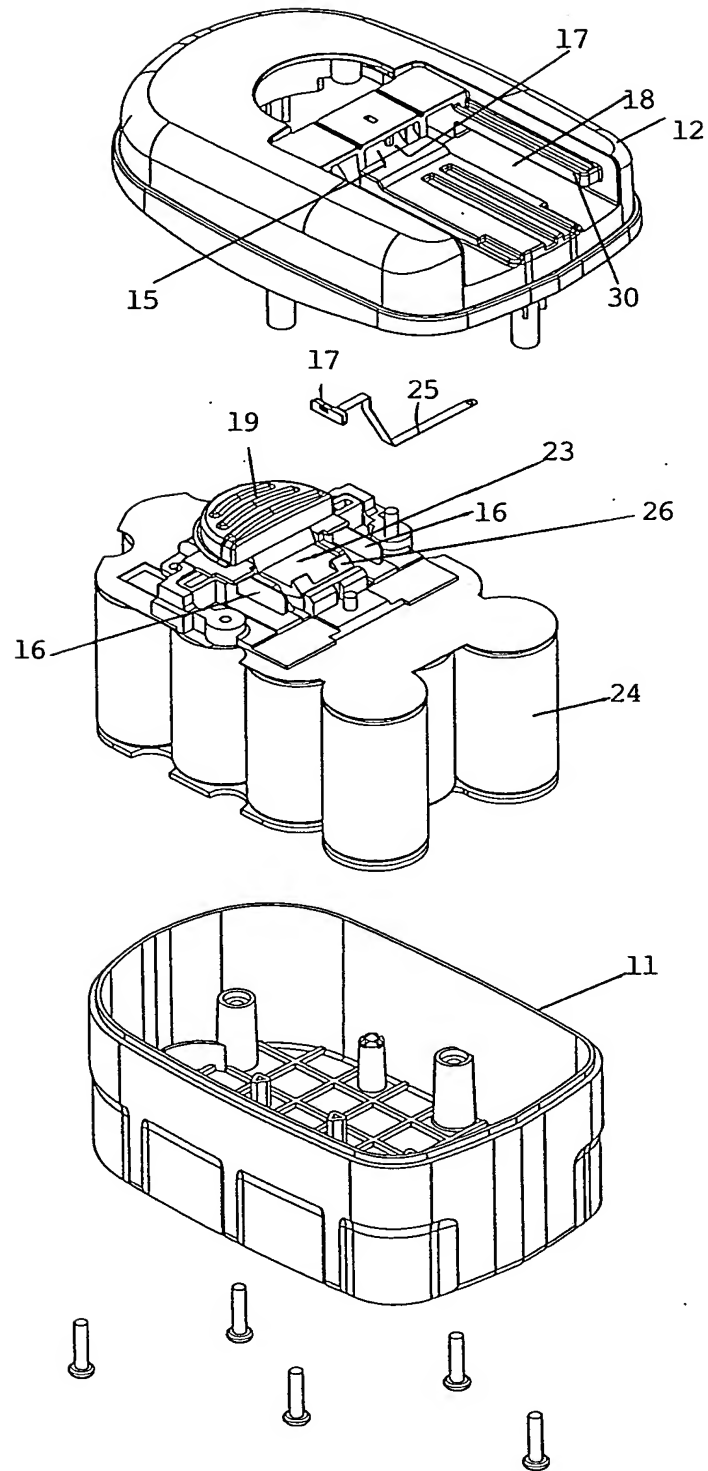


FIGURE 3

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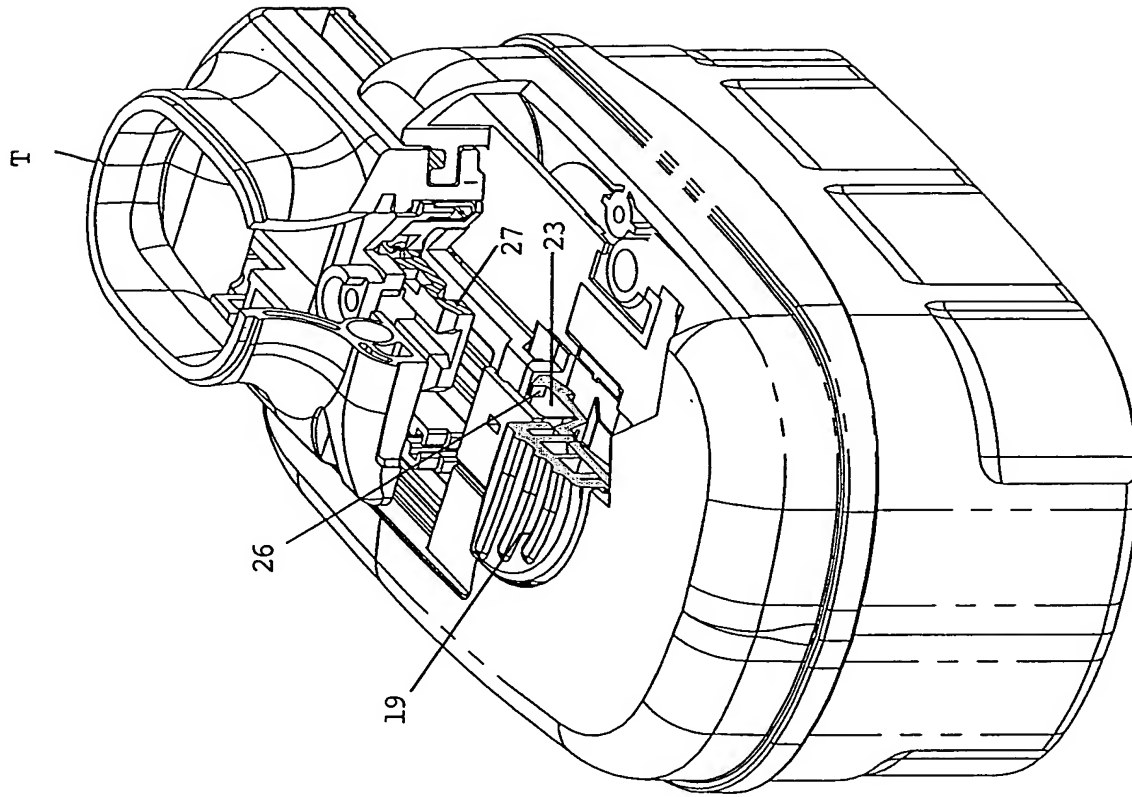


FIGURE 5

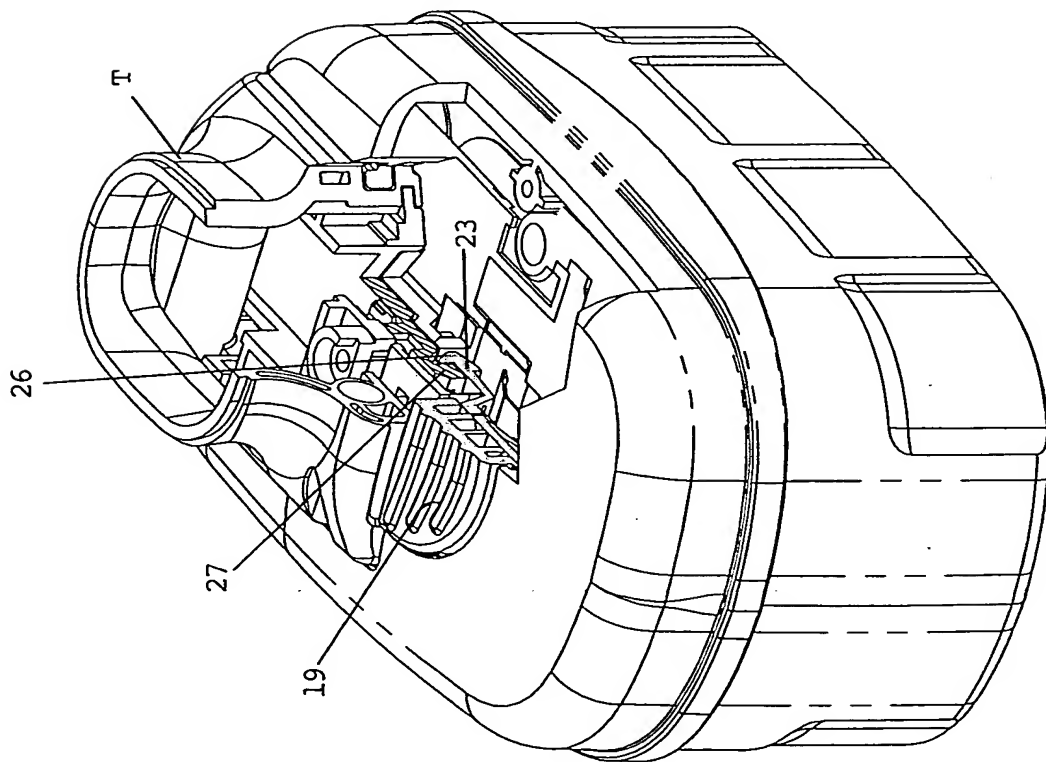


FIGURE 4

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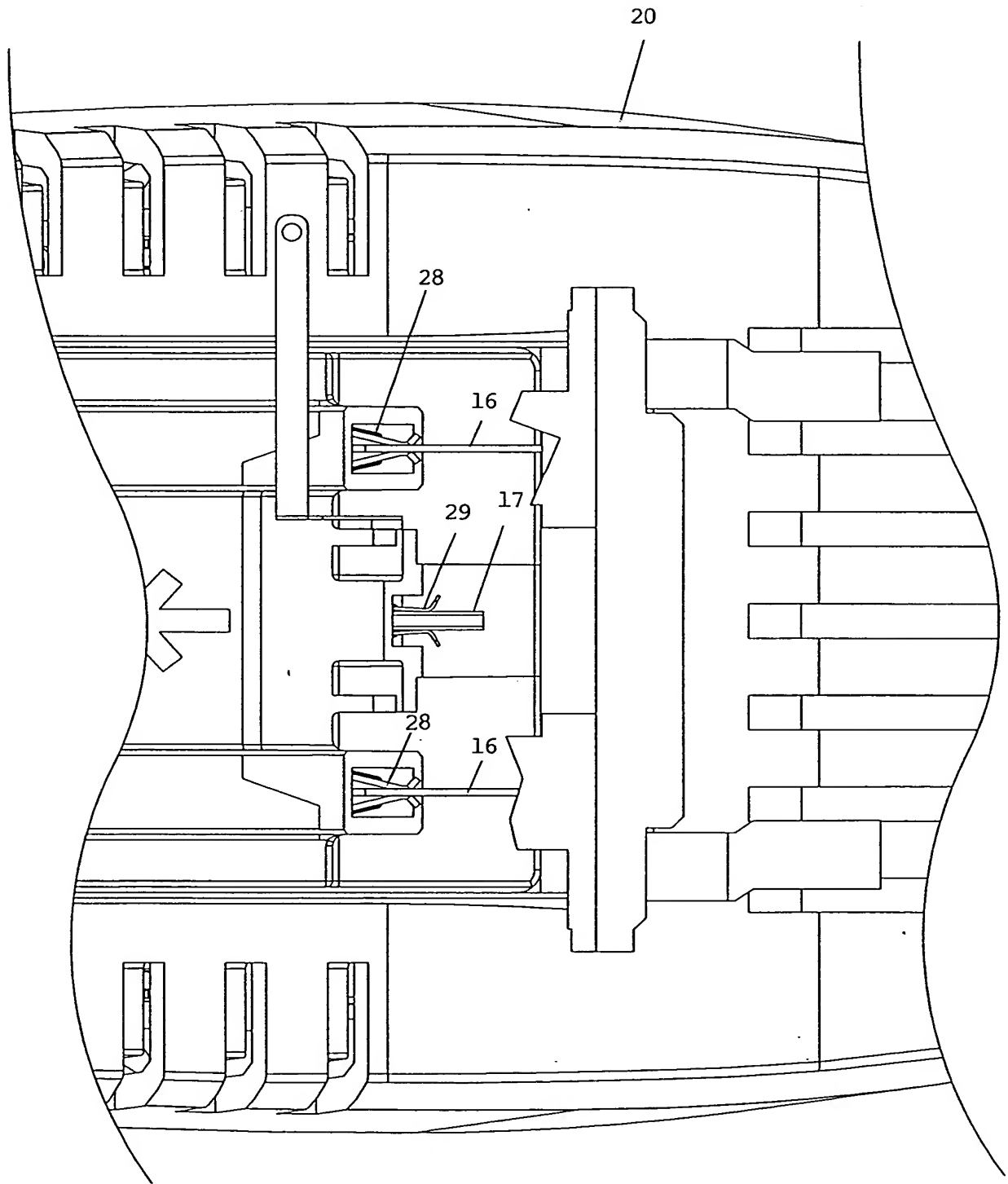


FIGURE 6

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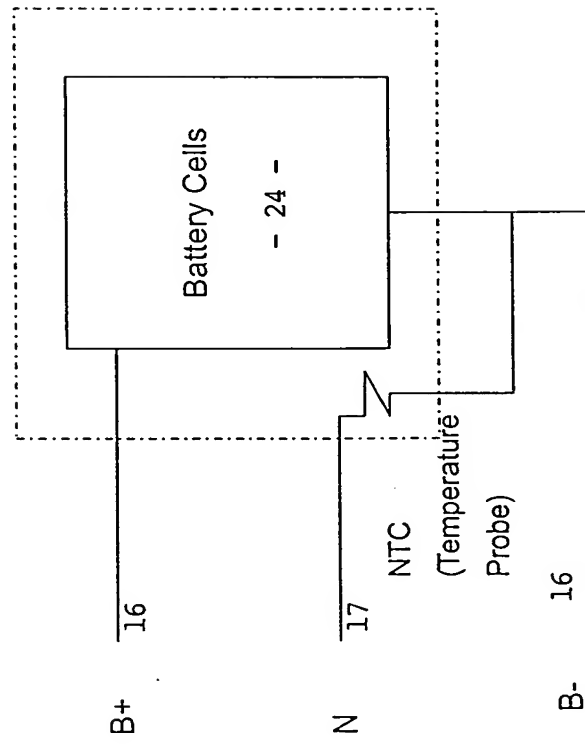


FIGURE 7

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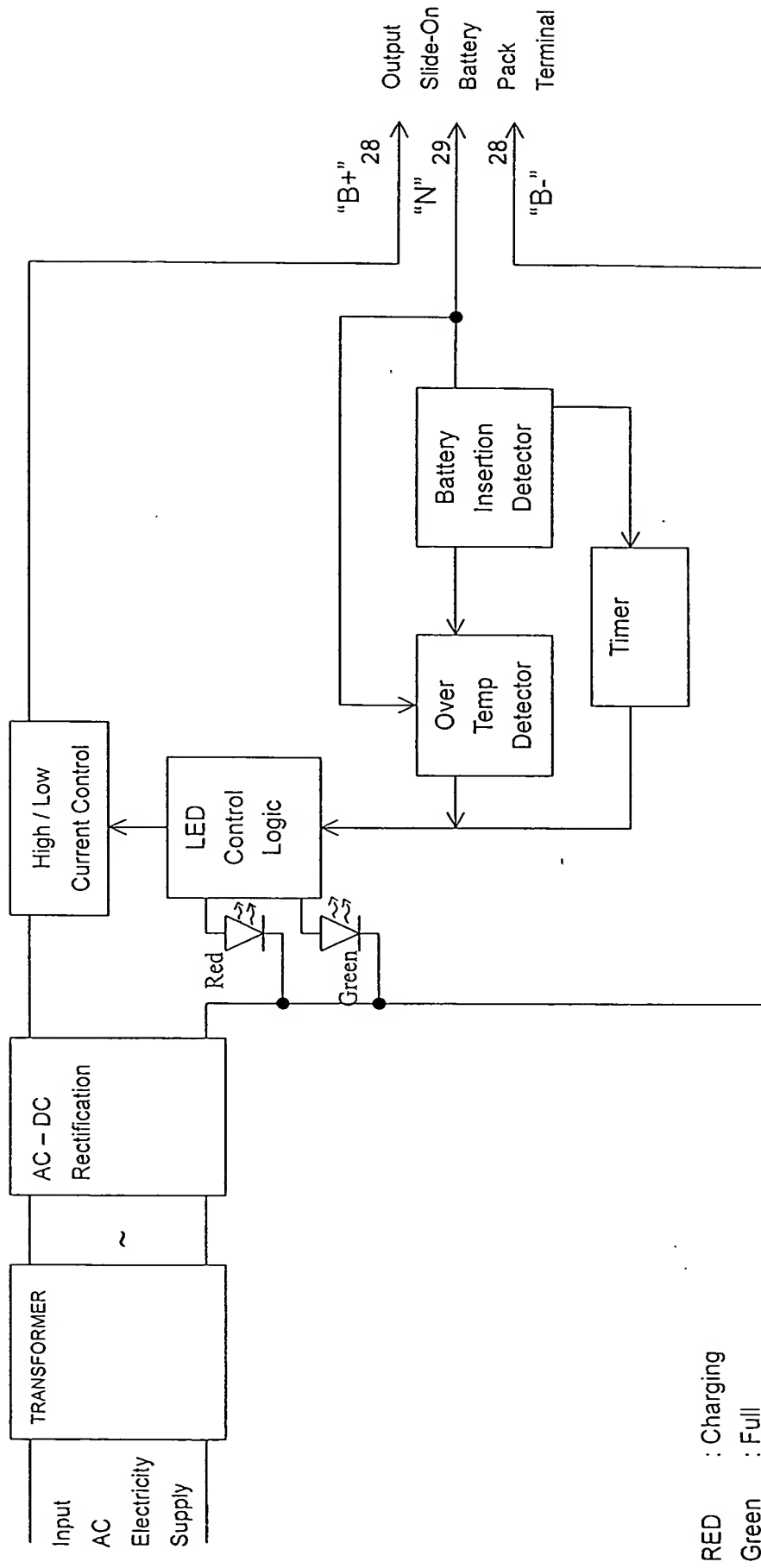


FIGURE 8

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